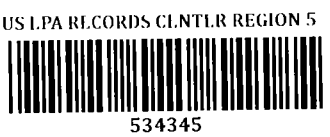
A.2
7/20/89



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO THE ATTENTION OF

Memorandum

Date: 20 JUL 1989

Subject: Proposed Action Level for Hexavalent Chromium at the Painesville Site

From: Arthur N. Lubin, Ph.D., Statistician ANL 7/20
Environmental Services Division

To: David Wilson, Remedial Project Manager
Waste Management Division

Per your request, I have reviewed the use of a T statistic derived upper confidence limit as the proposed action level for hexavalent chromium at the Painesville site per consent order C80-1857. The order suggests that the action level should be the upper confidence limit derived using the following formula:

$$\exp\left(\overline{X} + t_{.95}\left(s\sqrt{(1 + 1/n)}\right)\right)$$

where: $\overline{X}$ = mean of the daily values; s = standard deviation of the daily values; t_{95} = tabular upper limit one tailed t value at alpha equals five per cent; and n = number of daily values.

Using the above formula with the attached data, the action level was determined to be 0.06 ppm.

The use of a T statistic requires at least approximately normally distributed information. To address whether or not the logarithms of the daily averages are normally distributed the kurtosis and skewness coefficients were calculated. The calculated skewness coefficient was less than .05 and the kurtosis coefficient was approximately -0.75. Thus, based upon the kurtosis coefficient, the logarithm transformed information cannot be assumed to adhere to at least an approximately normal distribution. The statistical rule specifies that the kurtosis coefficient should be +/- 0.50 to assume normality. Consequently, I do not recommend using the proposed action level.

If you have further questions or I can be of further assistance, please feel free to contact me at 886-6226.

cc: N. Kohl (5MQAB)
V. Jones (5MQAB)

Attachment

T A B L E 1

DATA USED IN THE CALCULATION OF THE ACTION LEVEL FOR HEXAVALENT CHROMIUM

OBS	MONTH	DAY	YEAR	REPLICATES 1	2	3	AVERAGE
1	8	11	83	0.01	ND	0.01	.007
2	9	13	83	ND	ND	ND	.005
3	10	20	83	0.02	0.03	0.03	.027
4	11	17	83	ND	ND	ND	.005
5	12	21	83	0.08	0.07	0.08	.077
6	2	14	84	ND	ND	ND	.005
7	3	13	84	0.04	0.03	0.04	.037
8	4	24	84	0.01	0.02	0.01	.013
9	5	15	84	ND	0.01	ND	.007
10	6	12	84	0.02	0.03	0.03	.027
11	7	18	84	0.02	0.02	0.02	.020
12	8	24	84	0.04	0.03	0.04	.037
13	9	13	84	0.02	0.02	0.02	.020
14	10	9	84	0.01	0.01	0.01	.010
15	11	14	84	ND	ND	ND	.005
16	12	20	84	0.02	0.02	0.02	.020
17	1	29	85	0.03	0.03	0.04	.037
18	2	26	85	ND	ND	ND	.005
19	3	27	85	0.01	0.01	0.01	.010
20	4	23	85	0.02	0.02	0.02	.020
21	5	21	85	0.01	0.02	0.02	.017
22	6	27	85	0.02	0.02	0.02	.020
23	7	9	85	0.02	0.02	0.02	.020